What is claimed is:

1. A method of determining a gate capacitance of a MOS transistor, the method comprising:

(a) obtaining a measured capacitance and a measured dissipation factor by measuring the gate capacitance of the MOS transistor;

(b) obtaining a channel resistance and a tunneling resistance of an equivalent circuit of the MOS transistor;

(c) setting an initial capacitance and an error dissipation factor, which are required to find a calculated capacitance and a calculated dissipation factor, respectively;

(d) calculating a direct dissipation factor using the channel resistance, the tunneling resistance, and the initial capacitance;

(e) calculating the calculated dissipation factor using the error dissipation factor, the direct dissipation factor, and the measured dissipation factor;

(f) calculating the calculated capacitance using the channel resistance, the tunneling resistance, the initial capacitance, the error dissipation factor, and the measured dissipation factor;

(g) detecting the initial capacitance as an accurate gate capacitance of the MOS transistor when it is determined that the calculated capacitance is equal to the measured capacitance and the calculated dissipation factor is equal to the measured dissipation factor; and

(h) repeating steps (c) through (g) when at least one of the following conditions is true:

(1) the calculated capacitance is not equal to the measured capacitance, and

(2) the calculated dissipation factor is not equal to the measured dissipation factor.

2. The method of claim 1, wherein step (b) comprises:

(b1) measuring a direct gate current, a direct drain current, a direct gate voltage, and a direct drain voltage of the MOS transistor; and

(b2) obtaining the channel resistance and the tunneling resistance using the direct gate current, the direct drain current, the direct gate voltage, and the direct

drain voltage.

3. The method of claim 2, wherein the tunneling resistance is calculated by $R_t = L\left[\frac{Z_{dc}}{Y_{dc}}(Z_{dc} \cdot Y_{dc} + 2)\right]^{1/2} / \cosh^{-1}(Z_{dc} \cdot Y_{dc} + 2)$, and the channel resistance is calculated by $R_s = \frac{1}{R_t}\left[\frac{Z_{dc}}{Y_{dc}} \cdot 4 \cdot (Z_{dc} \cdot Y_{dc} + 2)\right]$,

wherein Z_{dc} is a drain impedance obtained by dividing the direct drain voltage by the direct drain current, Y_{dc} is a gate admittance obtained by dividing the direct gate current by the direct gate voltage, and L is a length of the MOS transistor.

4. The method of claim 1, wherein the error dissipation factor is obtained by subtracting the measured dissipation factor from the direct dissipation factor.

5. The method of claim 1, wherein the direct dissipation factor is calculated by $D_{dc} = \frac{A\sinh(L \cdot Y \cdot A) - B\sin(L \cdot Y \cdot B)}{A\sin(L \cdot Y \cdot B) + B\sinh(L \cdot Y \cdot A)}$,

wherein A is obtained by $A = \sqrt{\sqrt{1+(\omega c_i \cdot R_t)^2}} \cdot \cos(\frac{\tan^{-1}\omega c_i \cdot R_t}{2})$, B is obtained by $B = \sqrt{\sqrt{1+(\omega c_i + R_t)^2}} \cdot \sin(\frac{\tan^{-1}\omega c_i \cdot R_t}{2})$, Y is obtained by $Y = \sqrt{\frac{R_s}{R_t}}$, and L is a length of the MOS transistor.

6. The method of claim 1, wherein the calculated dissipation factor is calculated by $D_{m'} = D_{dc} \cdot (1 - D_{err}(1 + D_m))$,

wherein D_{dc} is the direct dissipation factor, D_m is the measured dissipation factor, and D_{err} is the error dissipation factor.

7. The method of claim 1, wherein the calculated capacitance is calculated by $C_{m'} = C_{m1} \cdot (1 - D_{err}/100 \cdot \sqrt{(1 + D_m{}^2)})$,

wherein D_{dc} is the direct dissipation factor, D_m is the measured dissipation factor, and

wherein C_{m1} is calculated by $Y_{ac} = 2 \cdot \frac{\tanh(\gamma \cdot \frac{L}{2})}{Z_O} = R' + jwC_{m1}$, where R' is a real number; L is a length of the MOS transistor, Y_{ac} denotes a gate input admittance of the MOS transistor, γ is calculated by $\gamma = \sqrt{\frac{R_s}{R_t} + jwC_i \cdot R_s}$, and Z_o is calculated by $Z_O = \sqrt{\frac{R_s \cdot R_t}{1 + jwC_i \cdot R_t}}$, where R_s is the channel resistance, and R_t is the tunneling resistance.

8. A method of determining a gate capacitance of a MOS transistor, comprising:

(a) measuring a measured capacitance and a measured dissipation factor of the MOS transistor;

(b) setting an initial capacitance;

(c) calculating a calculated capacitance and a calculated dissipation factor based on the initial capacitance;

(d) repeating steps (b) and (c) until both the calculated capacitance is equal to the measured capacitance and the calculated dissipation factor is equal to the measured dissipation factor; and

(e) detecting the initial capacitance as an accurate gate capacitance of the MOS transistor when it is determined that both the calculated capacitance is equal to the measured capacitance and the calculated dissipation factor is equal to the measured dissipation factor.

9. The method of claim 8, further comprising, prior to step (c):

measuring a direct gate current, a direct drain current, a direct gate voltage, and a direct drain voltage of the MOS transistor; and

obtaining a channel resistance and a tunneling resistance of the MOS transistor using the direct gate current, the direct drain current, the direct gate voltage, and the direct drain voltage,

wherein calculated dissipation factor is calculated in step (c) based upon the channel resistance and the tunneling resistance.

10. The method of claim 9, wherein the tunneling resistance is calculated by $R_t = L\left[\frac{Z_{dc}}{Y_{dc}}(Z_{dc}\cdot Y_{dc}+2)\right]^{1/2} / \cosh^{-1}(Z_{dc}\cdot Y_{dc}+2)$, and the channel resistance is calculated by $R_s = \frac{1}{R_t}\left[\frac{Z_{dc}}{Y_{dc}}\cdot 4\cdot(Z_{dc}\cdot Y_{dc}+2)\right]$,

wherein Z_{dc} is a drain impedance obtained by dividing the direct drain voltage by the direct drain current, Y_{dc} is a gate admittance obtained by dividing the direct gate current by the direct gate voltage, and L is a length of the MOS transistor.

11. The method of claim 10, wherein the calculated capacitance is calculated by $C_{m'} = C_{m1}\cdot(1 - D_{err}/100\cdot\sqrt{(1+D_m{}^2)})$,

wherein D_{dc} is a direct dissipation factor, D_m is the measured dissipation factor,

wherein the direct dissipation factor is calculated by

$$D_{dc} = \frac{A\sinh(L\cdot Y\cdot A) - B\sin(L\cdot Y\cdot B)}{A\sin(L\cdot Y\cdot B) + B\sinh(L\cdot Y\cdot A)},$$ and

wherein C_{m1} is calculated by $Y_{ac} = 2\cdot\frac{\tanh(\gamma\cdot\frac{L}{2})}{Z_O} = R' + jwC_{m1}$, where R' is a real number; L is a length of the MOS transistor, Y_{ac} denotes a gate input admittance of the MOS transistor, γ is calculated by $\gamma = \sqrt{\frac{R_s}{R_t} + jwC_i\cdot R_s}$, and Z_o is calculated by $Z_O = \sqrt{\frac{R_s\cdot R_t}{1 + jwC_i\cdot R_t}}$, where R_s is the channel resistance, and R_t is the tunneling resistance.

12. The method of claim 8, wherein the calculated dissipation factor is calculated by $D_{m'} = D_{dc}\cdot(1 - D_{err}(1+D_m))$,

wherein D_{dc} is a direct dissipation factor, D_m is the measured dissipation factor, and D_{err} is an error dissipation factor,

wherein the direct dissipation factor is calculated by

$$D_{dc} = \frac{A\sinh(L\cdot Y\cdot A) - B\sin(L\cdot Y\cdot B)}{A\sin(L\cdot Y\cdot B) + B\sinh(L\cdot Y\cdot A)},$$ and

wherein the error dissipation factor is obtained by subtracting the measured dissipation factor from the direct dissipation factor.